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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/853,083	05/10/2001	Kenji Uchiyama	9319S-000204	5266

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EXAMINER	
RUDE, TIMOTHY L	

ART UNIT	PAPER NUMBER
2883	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/853,083	UCHIYAMA, KENJI	
	Examiner	Art Unit	
	Timothy L. Rude	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,5-14 and 16-25* is/are pending in the application.

4a) Of the above claim(s) *1,3,5-13,16-20,22,24 and 25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *14,21 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims

1. Claims 14 and 23 are amended.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 14 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al (Takahashi) USPAT 6,266,119 in view of Ishikawa et al (Ishikawa) USPAT 5,258,866 and Ueda (Ueda) USPAT 5,838,412.

As to claim 14, Takahashi discloses an apparatus (Applicant's electro-optical device) made by a method using substrate alignment marks, A1, A2, spaced approximately equal to the spacing of driver board (Applicant's mount base member) alignment marks B1, and B2, (Figure 6) wherein one of the first and second alignment marks has a cross shape and the other of the first and second alignment marks has a cross shape that corresponds to the other cross shape. (Figure 6; Applicant's plurality of second alignment marks being arranged at a spacing approximately equal to a spacing

of the plurality of first alignment marks) to accurately align one set of terminals on said substrate with another opposing set of terminals on the driver board flexible film to facilitate thermal compression bonding.

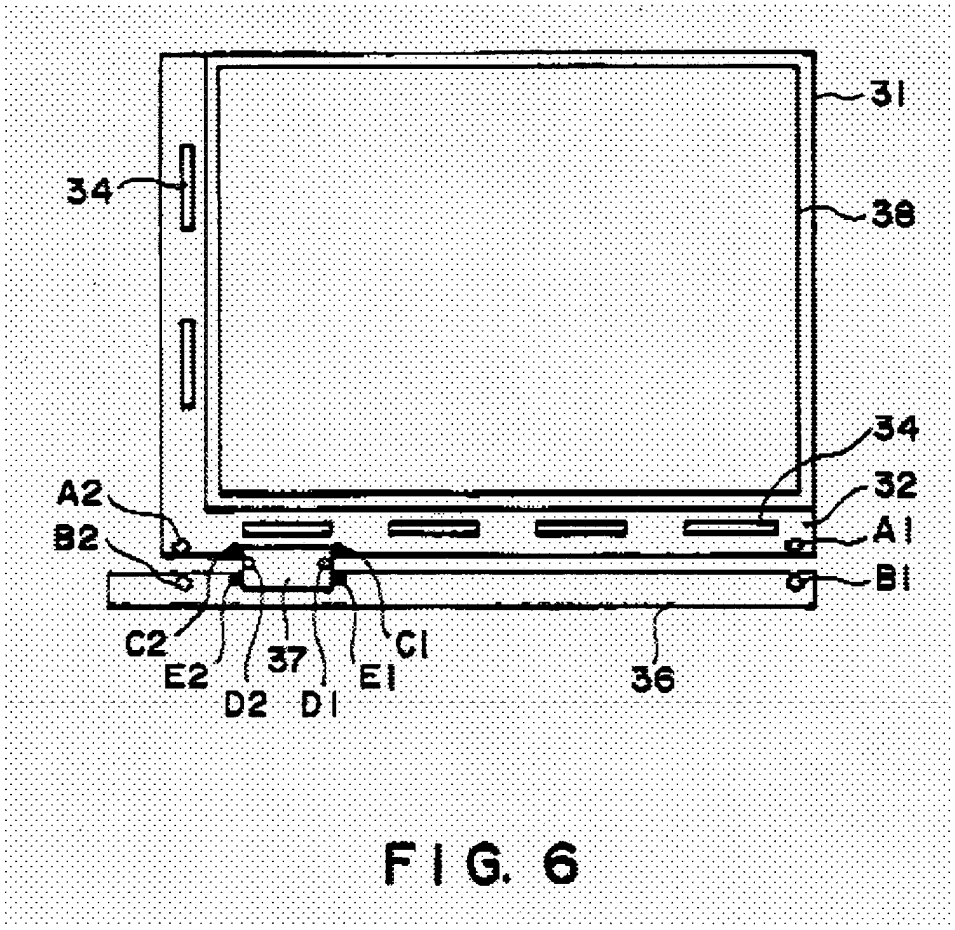


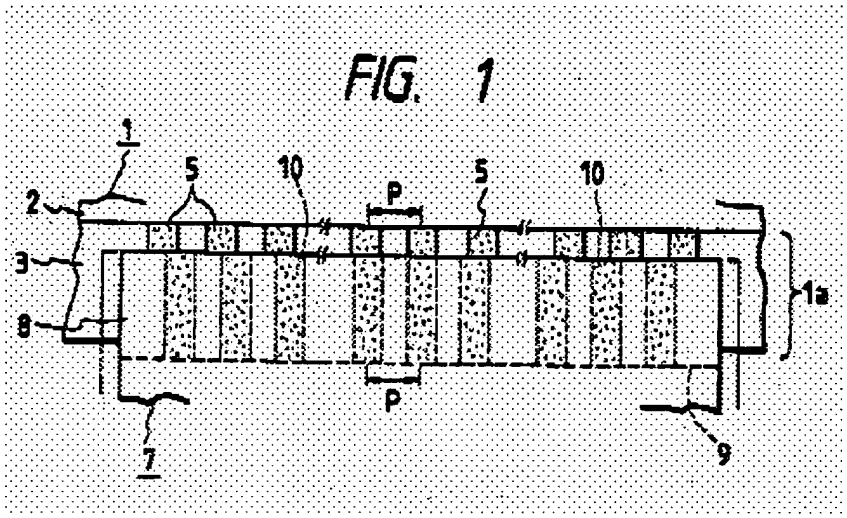
FIG. 6

Takahashi discloses the nature of the alignment problem, the dimensional change due to process heating, and decreasing the error by finely adjusting a size of a mask used in the electrode pattern formation (col. 1, lines 51-67, and col. 2, lines 1-48, especially col. 2, lines 29-39) so the pitches become substantially equal to each other

during the bonding process (dimensional error reduced to acceptable magnitude which results in substantially equal pitch).

Takahashi does not explicitly disclose (1) the mount base member having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the substrate, and (2) one of the first and second alignment marks having a cross shape is an open shape and the other of the first and second alignment marks having a cross shape is a closed shape that corresponds to the open cross shape.

Ishikawa teaches (1) the use of a flexible circuit board (Applicant's mount base member) with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α (Abstract, and Col. 4, lines 11-41) to ensure electrode terminals of the flexible circuit board and terminals of the glass substrate are connected to each other in a fully registered condition (Applicant's directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch), and wherein the spacing of the alignment marks on the mount base member would necessarily be space more apart due to the linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate.



Ishikawa is evidence that ordinary workers in the art of liquid crystals would find the reason, suggestion, or motivation to add the use of a mount base member with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α to ensure the method directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch which would have advantages including improved yield, improved ruggedness, improved ohmic contact, finer pitch terminal banks, etc.

Therefore, it would have been obvious to one having ordinary skill in the art of liquid crystals at the time the invention was made to modify the method of Takahashi with the use of a mount base member with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α to ensure the method directly connects the first terminal bank and the second terminal bank, both of which become substantially

equal to each other in pitch, thereby making obvious the claimed method comprising: a first step of aligning the substrate with the mount base member so that a plurality of first alignment marks, which are formed on the surface of the substrate and arranged to be opposed to each other with a first terminal bank interposed therebetween, is aligned with a plurality of second alignment marks, which are formed on the surface of the mount base member and arranged to be opposed to each other with a second terminal bank interposed therebetween, the first terminal bank being formed on the surface of the substrate, the second terminal bank being formed on the surface of the mount base member at a pitch which is smaller than a pitch of the first terminal bank, the plurality of second alignment marks being arranged at a spacing approximately equal to a spacing of the plurality of first alignment marks; and

a second step of connecting the first terminal bank to the second terminal bank with thermal compression bonding, the mount base member having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the substrate;

wherein the connection step directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch when the substrate and the mount base member are deformed during the thermal compression bonding of the substrate and the mount base member, and wherein during the connection step, the plurality of second alignment marks become spaced mutually more apart than the spacing of the first alignment marks due to thermal expansion.

Ueda teaches (2) one of the first and second alignment marks has an open shape [ALMD in Figure 16A] and the other of the first and second alignment marks has a closed shape [ALC in Figure 20] that corresponds to the open shape [col. 14, lines 29-33] for an art recognized equivalent means for the same purpose of facilitating an alignment [MPEP 2144.06].

Ueda is evidence that ordinary workers in the art of liquid crystals would find the reason, suggestion, or motivation to add the use of one of the first and second alignment marks having an open shape and the other of the first and second alignment marks having a closed shape that corresponds to the open shape for an art recognized equivalent means for the same purpose of facilitating an alignment.

Therefore, it would have been obvious to one having ordinary skill in the art of liquid crystals at the time the invention was made to modify the device of Takahashi with the use of one of the first and second alignment marks having an open shape and the other of the first and second alignment marks having a closed shape that corresponds to the open shape of Ueda for an art recognized equivalent means for the same purposes of facilitating an alignment.

As to claim 21, Takahashi discloses the use of polyimide film with a thickness of 15-75 μm (col. 5, lines 11-19) which overlaps the claimed range. Takahashi discloses the dimensional error due to process heating to be generally between 0.05% and 0.1% (col. 2, lines 35-39) which would necessitate a corresponding pitch reduction range that compares to the claimed range. The expansion coefficient range would be inherent to

the film material, would vary accordingly, and would affect the thermal expansion and in turn the selected pitch compensation.

Takahashi discloses the use of glass (col. 1, lines 51-53) and said polyimide as an example material (col. 5, lines 15-19). Substitution of similar materials (with thermal expansion coefficients in the claimed range resulting in alignment mark spacing in the claimed range) is not considered patentably distinct unless unexpected results are obtained.

3. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Ishikawa.

As to claim 23, Takahashi discloses an apparatus (Applicant's electro-optical device) made by a method using substrate alignment marks, A1, A2, spaced approximately equal to the spacing of driver board (Applicant's mount base member) alignment marks B1, and B2, (Figure 6) (Applicant's plurality of second alignment marks being arranged at a spacing approximately equal to a spacing of the plurality of first alignment marks) to accurately align one set of terminals on said substrate with another opposing set of terminals on the driver board flexible film to facilitate thermal compression bonding.

Takahashi discloses the nature of the alignment problem, the dimensional change due to process heating, and decreasing the error by finely adjusting a size of a

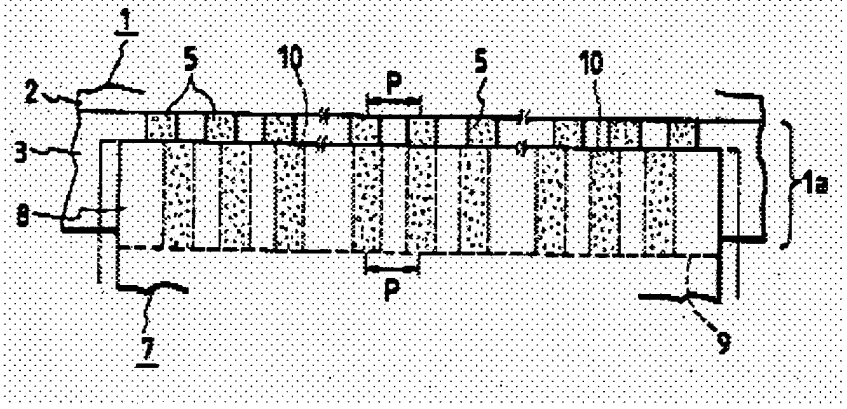
mask used in the electrode pattern formation (col. 1, lines 51-67, and col. 2, lines 1-48, especially col. 2, lines 29-39) so the pitches become substantially equal to each other during the bonding process (dimensional error reduced to acceptable magnitude which results in substantially equal pitch).

Takahashi does not explicitly disclose the mount base member having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the substrate.

Ishikawa teaches the use of a flexible circuit board (Applicant's mount base member) with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α (Abstract, and Col. 4, lines 11-41) [Applicant's – the second expandable terminal bank including a first pitch that is smaller than a first pitch of a first expandable terminal bank formed on the substrate] to ensure electrode terminals of the flexible circuit board and terminals of the glass substrate are connected to each other in a fully registered condition (Applicant's directly connects the first expandable terminal bank and the second expandable terminal bank, both of which become substantially equal to each other in pitch), and wherein the spacing of the alignment marks on the mount base member would necessarily be space more apart due to the linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate. Please note that the relationship of the two rates of expansion of Ishikawa may be expressed as Applicant's the second expandable terminal bank expands by b times and the first expandable terminal bank expands by a times according to the linear

thermal expansion coefficients of the mount base member and the substrate such that the second expandable terminal bank is directly connectable to the first expandable terminal bank formed on the substrate, the second expandable terminal bank has a second pitch that is substantially equal to a second pitch of the first terminal bank with substitution of terms in simple algebra.

FIG. 1



Ishikawa is evidence that ordinary workers in the art of liquid crystals would find the reason, suggestion, or motivation to add the use of a mount base member with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α to ensure the method directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch which would have advantages including improved yield, improved ruggedness, improved ohmic contact, finer pitch terminal banks, etc.

Therefore, it would have been obvious to one having ordinary skill in the art of liquid crystals at the time the invention was made to modify the device of Takahashi with the use of a mount base member with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α to ensure the method directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch, thereby making obvious the claimed method comprising: a first step of aligning the substrate with the mount base member so that a plurality of first alignment marks, which are formed on the surface of the substrate and arranged to be opposed to each other with a first terminal bank interposed therebetween, is aligned with a plurality of second alignment marks, which are formed on the surface of the mount base member and arranged to be opposed to each other with a second terminal bank interposed therebetween, the first terminal bank being formed on the surface of the substrate, the second terminal bank being formed on the surface of the mount base member at a pitch which is smaller than a pitch of the first terminal bank, the plurality of second alignment marks being arranged at a spacing approximately equal to a spacing of the plurality of first alignment marks; and

a second step of connecting the first terminal bank to the second terminal bank with thermal compression bonding, the mount base member having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the substrate;

wherein the connection step directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch when the substrate and the mount base member are deformed during the thermal compression bonding of the substrate and the mount base member, and wherein during the connection step, the plurality of second alignment marks become spaced mutually more apart than the spacing of the first alignment marks due to thermal expansion.

Response to Arguments

4. Applicant's arguments filed on 23 November 2004 have been fully considered but they are not persuasive.

Applicant's ONLY arguments are as follows:

1) Prior art does not teach open and closed cross shaped marks.

2) Ishikawa does not teach use of alignment marks.

3) Since Ishikawa teaches alignment by electrodes, a combination is improper.

4) There is no teaching that the expansion of both the mount base member and substrate are taken into consideration.

5) There is no motivation to combine.

Examiner's responses to Applicant's ONLY arguments are as follows:

1) It is respectfully pointed out that new grounds of rejection are applied above.

2) It is respectfully pointed out that Ishikawa was not applied to teach alignment marks.

3) It is respectfully pointed out that a reference my be relied upon for all it would have taught one of ordinary skill in the art [MPEP 2144.01], and is not limited to the explicit embodiments. Ishikawa was applied to teach the accommodation of two different rates of thermal expansion by adjusting pitch in accord with said rates per rejections above.

4) It is respectfully pointed out that Ishikawa teaches the use of a mount base member with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α to ensure the method directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch (Abstract, and col. 4, lines 11-41) per rejections above.

5) It is respectfully pointed out that Ishikawa teaches the use of a mount base member with pitch $p=P/(1+\alpha)$ having a linear thermal expansion coefficient that is larger than a linear thermal expansion coefficient of the glass substrate by an amount related to α to ensure the method directly connects the first terminal bank and the second terminal bank, both of which become substantially equal to each other in pitch (Abstract, and col. 4, lines 11-41) per rejections above. Examiner considers the motivation to address the problem of thermal expansion rates more thoroughly per Ishikawa to be robust. It would have been obvious to those of ordinary skill in the art of liquid crystals at the time the claimed invention was made to improve the terminal alignment of

Takahashi with the more robust approach of Ishikawa for any of a number of reasons, including improved yield, improved ruggedness, improved ohmic contact, finer pitch terminal banks, etc.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy L. Rude whose telephone number is (571) 272-2301. The examiner can normally be reached on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Timothy L Rude
Examiner
Art Unit 2883

tlr

Frank G. Font
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